Example Calculation for Percentage of Contaminant (1,2-Dichlorobenzene) emitted (X)

Reference Document: The EPA's *Models for Air Emission Rates from Superfund Remedial Actions* dated March 8, 1993 Section 4.2: Dredging

1. The Henry's Law Constant for 1,2-Dichlorobenzene from Appendix A is 1.94×10^{-2} atm-m^3/g-mol. Divide by R*T to convert to dimensionless units:

   $H = 1.94 \times 10^{-2} / (8.20 \times 10^{-5} * 298)$

   $H = 7.94 \times 10^{-2}$

2. The diffusivity in water (Dw) and the log of the octanol-water partition coefficient (log Kow) from Appendix A is as follows: **$Dw = 7.9 \times 10^{-6}$** and log Kow=398.1 (taking the inverse log, **Kow=3,981.1**).

   Equation 4-16 (De= 0.45Dw / 0.55 + 0.30Kow) to calculate the effective diffusivity of the contaminant in sediment air pores (De).

   $De = 0.45 * 7.9 \times 10^{-6} / 0.55 + 0.30 * 3{,}981.1$

   $De = 2.97 \times 10^{-9}$

3. Equation 4-13 ($Kd = H^* De * pi^2/4\ l^2$) to calculate the pollution volatilization constant (Kd). The default value for depth of dredged sediment (l) assumed to be 2.5 feet (**l=76.2** centimeters).

   $Kd = 7.94 \times 10^{-2} * 2.97 \times 10^{-9} * 3.14^2 / 4 * 76.2^2$

   $Kd = 1.003 \times 10^{-13}$

4. Equation 4-11 ($X = 0.72(Kdt)^{1/2}$ to calculate the fraction of pollutant that is emitted (X). Sediment exposure time (t) assumed to be 1 day (**t=86,400** seconds).

   $X = 0.72 * (1.003 \times 10^{-13} * 86{,}400)^{1/2}$

   X=0.007%

5. Equation 4-12 ($H^*De^*t/l^2 < 0.25$) to validate that Equation 4-11 is valid.

   $7.94 \times 10^{-2} * 2.97 \times 10^{-9} * 86{,}400 < 0.25$

   $3.5 \times 10^{-9} < 0.25$